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(Angular velocity)^2 when rod reaches vertical 1st time

$$=\omega^2{}_2=\frac{15g}{4a}=\frac{4g}{a}\cdot\frac{15}{16}.$$

(Angular velocity)^2 when rod reaches vertical 2nd time

$$=\omega^2{}_4=\frac{4g}{a}\cdot\frac{255}{256}.$$

(Angular velocity)^2 when rod reaches vertical 3rd time

$$=\omega^2{}_6=\frac{4g}{a}\cdot\frac{4095}{4096}.$$

……

$\therefore$ (Angular velocity)^2 when rod reaches vertical nth time

$$=\frac{4g}{a}\cdot\frac{4^{2n}-1}{4^{2n}}=\frac{4g}{a}\left[1-\left(\frac{1}{4}\right)^{2n}\right].$$

The result given by Price is $\frac{4g}{a}\left[1+\left(\frac{1}{4}\right)^{4n-2}\right]$.

◆

DIOPHANTINE ANALYSIS.

Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him.

SOLUTION TO THE CELEBRATED INDETERMINATE EQUATION.

$$x^2-Ny^2=\pm1.$$

By A. H. BELL, Hillsboro, Illinois.

[Continued from the May Number.]

Well known Formulas employed to shorten the computations.

The No. of Terms of the series is nearly equal to $(D_1\div D_2+1)2=(J)$.

The convergent Series for the nth Term is, $S_n=S_1+(M-1)(n-2)\frac{D_2}{2}+(n-1)D_1=(K)$.

The Series of the m^s and n^s for the nth Term is; $M_n=M_1+(n-1)$. Com. Diff. $=(L)$.

PROCESS: Having the number of Terms by (J); obtain the conv. Diff. for $(n-1)^{th}$ Term by (K): then add the D_1 or the 1st order of Difference for this Term will give the nth term; if the two convergent differences are of contrary signs. The necessary limit or end of the Series for our purposes is complete; the D_1 to be added is the same as $(L)=D_n=D_1+(n-1)D^2=(M)$.

Example $x^2-61y^2=\pm1$. To find x and y. Some new features will be introduced in this example, and only the actual work is shown.

Series A.

No. of Terms 1st 2nd......4th 5th.

Conv. Diff. +15 −3......−9 +5.

$D_1 = -18$

$D_2 = +8$

Series *B*. No. 1 2 3 4

+*A*.5

Name of term *C*.Diff.+*A*.4

Conv. Diff. +4 −9 −12 −5

D_1 −13

D_2 +10

Series *C*. No. 1 2.........4 5

+*B*.4

Name *B*. 3 + *A*. 5

Conv. Diff. −12 +5.........+9 −4

D_1 + 17

D_2 − 10

Series *D*. No. 1 2.........4 5

+ *C*.5

B.4+ *C*.4

Diff. . −5 +9 +13 +3

+14

−8

Series *E*. No. 1 2..............6

+*D*.5

D.4+ *C*.5

Conv. Diff. +13 −4 +1

−17

+6

m and *n*, in column.

Operation.	m^s	n^s
Com. Diff. =	5......	39.
	×3	×3
	15	117
Add...........	1........	8
Series *A*. 4,=	16.....	125
Series *A*. 5,=	21.....	164
	×1	
Add *A*,4=*B*.3=	37.....	289
B.4=	58....	453
	×2	
	116	906
Add	21	164
C. 4 =	137....	1070
C. 5 =	195....	1523
	×2	
	390	3046
Add	137	1070
D. 4 =	527....	4116
D. 5 =	722....	5639
	×5	
	3610	28195
Add *C*, 5 =	195	1523
E. 6. =	3805.m^s.	29718.n^s

∴ we have the −1. condition. The +1. condition is by formula (*A*). These are the 1st. and least values that can be given.

The amount of work required in this class of numbers *N*, is equivalent to summing two cycles of continued fraction.

From Legendre's Table, date 1798 $x^2-991y^2=\pm1$

x=397516,400906,811930,638014,896080.

y=12055,735790,331359,447442,538767.

In the celebrated "Cattle Problem" of Archimedes,

$x^2-410,286423,278424,\ y^2=+1$ x not being required. The Hillsboro, Ill. Mathematical Club, make y=185892,190138,691330,945825,420863.... 103224 digits....710208,663490. Making a number ¼ mile long.